

REMARKS

In paragraph 1 of the Office Action claims 1-3, 6-9, 12, 13, 16, 17, 19, 21, 24, 26 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al. (hereinafter Chen) (US 6,724,569 B1), stating:

“Regarding claims 1-3, 16 and 26, Chen discloses a hard disk drive comprising:
at least one hard disk 410 being adapted for rotary motion upon a disk drive;
at least one slider device 420 having a slider body portion being adapted to fly over said hard disk;
a magnetic head (100; part of merged head assembly 420) being formed on said slider body for writing data to said hard disk, said magnetic head [Figure 4] including:
a first magnetic pole 115;
a second magnetic pole 135;
a write gap layer 120 being disposed between said first and second magnetic poles, where said write gap layer includes at least two sublayers 120a, 120c, including an adhesion sublayer and an electrically conductive, non-magnetic sublayer [i.e., layers may be formed of the same, or of different materials; col. 6, lines 6-10].

As the claims are directed to a magnetic head, per se, the method limitation(s) appearing in claim 2, claim 3, claim 17 and lines 2 to 8 of claim 26, can only be accorded weight to the extent that it/they affect the structure of the completed magnetic head. Note that "determination of patentability in 'product-by-process' claims is based on product itself, even though such claims are limited and defined by process [i.e., "electroplating", "electroplating a second magnetic pole upon said electrically conductive, non-magnetic sublayer", for instance], and thus product in such claim is unpatentable if it is the same as, or obvious form, product of prior art, even if prior product was made by a different process", In re Thorpe, et al., 227 USPQ 964 (CAFC 1985). Furthermore, note that a "product-by-process claim, although reciting subject matter of claim in terms of how it is made [i.e., "electroplating"; "electroplating a second magnetic pole upon said electrically conductive, non-magnetic sublayer", for instance], is still product claim; it is patentability of product claimed and not recited process steps that must be established, in spite of fact that claim may recite only process limitations", In re Hirao and Sato, 190 USPQ 685 (CCPA 1976).

Regarding claims 6-9, 12, 13, 19, 21, 24 and 27, Chen discloses the gap sublayers are about 200 Angstroms [col. 5, lines 60-64]. Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation and optimization in the absence of criticality. In re Swain et al., 33 CCPA (Patents) 1250, 156 F2d 239, 70 USPQ 412; Minnesota Mining and Mfg. Co. v. Coe, 69 App. D.C. 217,

99 F2d 986, 38 USPQ 213; Allen et al. v. Coe, 77 App. D.C. 324, 135 F2d 11, 57”.

Responsive hereto, Applicant has amended the claims to recite further limitations that are not taught by the cited prior art; specifically, that the second magnetic pole is disposed directly upon the electrically conductive non-magnetic sublayer.

Regarding Applicant's invention, it involves the fabrication of the second magnetic pole. In accomplishing this, the magnetic material of the pole is disposed directly upon a non-magnetic write gap sublayer that is electrically conductive.

Regarding the teachings of Chen '569, it teaches a write gap layer that is composed of multiple layers 120a, 120b, 120c; however, significantly, a magnetic pole seed layer is then used in forming the upper pole structure, as is stated in col. 5, lines 8-11:

“The third write gap layer 120c also offers some protection of the stack insulation 160 during the ion milling process used for removing a seed layer used in forming the upper pole structure 130.” Emphasis added.

Furthermore, Chen describes the write gap layers as being composed of inorganic and/or dielectric materials, as is set forth in col. 6, lines 6-10:

“The first, second, and third write gap layers 230a, 120b, and 120c may be formed of inorganic materials such as Al₂O₃, AlON, AlN, SiO₂, SiON, or the like, or other known dielectric material. Further, layers may be formed of the same, or of different materials.”

where Applicant's write gap sublayer is composed of a non-magnetic, electrically conductive material. Therefore, it can be seen that Chen '569 teaches a magnetic head that includes a multi-layer write gap structure that also has a seed layer formed thereon, and the second magnetic pole is formed upon the seed layer. Applicant's invention, as described in amended independent claim 1 includes a write gap having a sublayer that is composed of a non-magnetic, electrically conductive material, where the second magnetic pole is disposed directly upon the non-magnetic, electrically conductive write gap sublayer. Chen's mention that the write gap may include “Further, layers” that “may be formed of the same or different materials” does not teach Applicant's particular write gap sublayer; and Chen still includes another seed layer for forming the second magnetic pole thereon (as urged above). Applicant therefore respectfully submits that the teachings of Chen '569 do not anticipate Applicant's invention as set forth in amended independent claim 1.

Regarding amended independent claim 16, it is directed to a hard disk drive device, and it has been amended in a manner similar to amended independent claim 1. Applicant therefore incorporates its remarks set forth hereabove regarding the allowability of amended independent claim 1, and Applicant asserts that amended independent claim 16 is likewise allowable.

Regarding independent claim 26, it recites a method for fabricating a magnetic head and it recites the step of electroplating a second magnetic pole upon the electrically conductive, non-magnetic sublayer of the write gap layer. Chen '569 fails to teach the utilization of such a write gap sublayer in fabricating the second magnetic pole directly thereon. Rather, Chen teaches the use of a separate seed layer that is fabricated upon the write gap layer, where the second magnetic pole is electroplated upon the seed layer. Applicant therefore respectfully submits that independent method claim 27 recites limitations that are not taught by Chen '569.

Regarding dependent claims 3, 6-9, 12, 13, 17, 19, 21, 24 and 27, Applicant submits that each of these dependent claims are allowable in that they include subject matter that is not taught by Chen '569, and alternatively, that they are allowable in that they depend either directly or indirectly from an allowable independent base claim.

In paragraph 2 of the Office Action dependent claims 4, 5, 10, 11, 14, 15, 17, 20, 22, 23, 25 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (hereinafter Chen) (US 6,724,569 B1) as applied to claims 1 and 16 above, and further in view of Han et al. (hereinafter Han) (US 6,960,281 B1), stating:

"Regarding claims 4 and 17, Chen discloses all the features, supra, except said adhesion layer is comprised of a material selected from the group consisting of Ta, Ti, Cr or NiCr.

Regarding claims 5, 20 and 28, Chen discloses all the features, supra, except said electrically conductive, non-magnetic sublayer is comprised of a material selected from the group consisting of Rh, Ru, Ir, Mo, W, Au, Be, Pd, Pt, Cu, PtMn and Ta.

Regarding claims 10 and 22, Chen discloses all the features, supra, except the second magnetic pole is comprised of a CoFe alloy.

Han teaches the use of gap-filling materials NiCr, Cr, NiFeCr, Rh and Ru, that satisfy the equal etch rate criterion of both the shield layer material, the seed layer materials and plated pole portion [col. 3, lines 10-25]. Also, Han teaches a pole piece comprised of a CoFe alloy (i.e., CoNiFe) [col. 3, lines 38-41].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the gap sublayers and the second magnetic pole of Chen with the materials as taught by Han.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the gap sublayers and the

second magnetic pole of Chen with the materials as taught by Han because they are known gap layer materials that are used in magnetic heads and using them is merely a substitution of art recognized equivalents.

Regarding claims 11, 14, 15, 23, 25, 29 and 30, Chen discloses said write gap layer 120 also includes a third sublayer 120b that is disposed between said adhesion layer and said electrically conductive, non-magnetic sublayer. Chen does teach the third sublayer is comprised of a material that is etchable in reactive ion etch process.

Han teaches the use of gap-filling materials NiCr, Cr, NiFeCr, Rh and Ru, that satisfy the equal etch rate criterion of both the shield layer material, the seed layer materials and plated pole portion [col. 3, lines 10-25].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the gap sublayers of Chen with a third sublayer material as taught by Han.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the gap sublayers of Chen with the a third sublayer material as taught by Han because they are known gap layer materials that are used in magnetic heads and using them is merely a substitution of art recognized equivalents. Plus, the IBE rate is substantially the same as the IBE rate of both the shield layer and the materials of the seed layer and plated pole portion [Han; col. 3, lines 17-20].”

Responsive hereto, Applicant urges that these rejected dependent claims 4, 5, 10, 11, 14, 15, 17, 20, 22, 23, 25 and 28-30 are allowable in that they include limitations that are not obvious from the combined teachings of Chen in view of Han ‘281, and alternatively that they depend either directly or indirectly from an allowable independent claims 1, 16 or 26. With particular regard to the teachings of Han ‘281, it can be seen that Han teaches the fabrication of an additional seed layer 30 upon the write gap layer 20 and the plating of the upper pole piece 40 upon the seed layer 30, where the seed layer 30 is preferably composed of CoFeN, as is stated in col. 3, lines 31-36:

“Referring next to Fig. 1b, there is shown the formation of Fig. 1a wherein a seed layer (30) has been formed on the write gap layer to enhance the plating process of the upper pole piece. The seed layer is preferably a layer of CoFeN formed to a thickness between approximately 1000 and 3000 angstroms.”

Han ‘281 therefore fails to teach a second magnetic pole that is disposed directly upon a non-magnetic, electrically conductive write gap sublayer. In this regard, the teachings of both prior art references Chen ‘569 and Han ‘281 both teach the well known prior art electroplating process for fabricating a second magnetic pole in which a write gap structure is fabricated followed by the deposition of an electroplating seed layer, followed by the electroplating of the pole upon the

NOV 30 2006

seed layer. These teachings therefore teach away from Applicant's claimed invention in which the second magnetic pole is fabricated directly upon the write gap sublayer that is composed of a non-magnetic, electrically conductive material.

Additionally, in considering the teachings of Chen in view of the teachings of Han, it is urged in the Office Action that the write gap layer material of Han can be obviously substituted for the write gap layer material of Chen. In this regard, both Chen and Han then teach the use of a further seed layer upon which the second magnetic pole is fabricated. Applicant's invention is as claimed is distinguished therefrom in that Applicant's second magnetic pole is disposed directly upon the write gap sublayer (non-magnetic, electrically conductive), without the additional seed layer that is taught in both Chen and Han. The advantages and improvements described in Applicant's Specification result from Applicant's fabrication of the second magnetic pole directly upon the write gap sublayer without the necessity of utilizing a further seed layer to fabricate the second magnetic pole.

Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming at the Examiner's earliest opportunity. Should the Examiner have any questions or comments with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

Respectfully submitted,



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